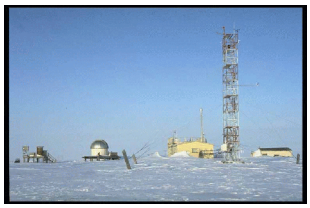
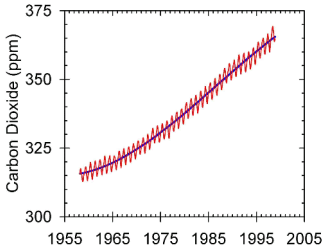
Climate Observations and Services: Baseline Observatories



The Barrow, Alaska Observatory where NOAA has maintained continuous atmospheric monitoring since 1973.



The long-term increase in global atmospheric carbon dioxide has been observed in the record from Mauna Loa Observatory dating from 1957.

The Samoa Observatory where NOAA has maintained continuous monitoring of atmospheric parameters since 1973.

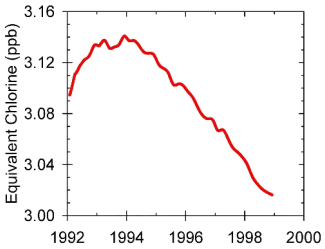
NOAA Request

As part of the $28 million FY 2001 request for the Climate Observations and Services Initiative in the Oceanic and Atmospheric Research budget activity, NOAA is requesting $3 million to implement crucial upgrades and enhanced measurement programs at its atmospheric baseline observatories to maintain the integrity and continuity of the long-term time series data they supply to the scientific community and policy makers. These observations are critical to maintaining the world's longest atmospheric time series (some dating from 1957) of atmosphere forcing agents such as carbon dioxide. These data supply critical information on the state and recovery of the ozone layer and measure the associated changes in surface ultraviolet (UV) and solar radiation levels, to name only a few.

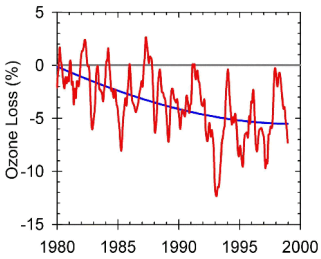
Background

NOAA maintains climate observatories at Barrow, Alaska; Mauna Loa, Hawaii; American Samoa; and South Pole, Antarctica. Because of their remote locations, continually monitored background levels of trace gases, aerosols, stratospheric ozone and solar energy are subject to minimal effects of pollutants from local sources. Taken together, these measurements provide the baseline to which other data from around the world have been compared for decades and from which an international policy such as the "Montreal Protocol" on control of chlorofluorocarbons was developed. In addition, NOAA measures regional levels of trace gases, ozone and solar radiation in 20 states and in 37 countries to monitor global sources and sinks of climate forcing agents and their regional variability.

The continuity of these data, however, is in jeopardy because the stations have suffered steady degradation over the decades they have been in operation and because of the increased costs of the monitoring programs. Due to inflationary erosion of base funding, these sites have insufficient resources to complete routine equipment upgrades and facility maintenance or for the purchase of operational supplies such as ozonesondes. Mauna Loa Observatory (MLO) alone has doubled its monitoring responsibilities over the past 10 years due to requirements associated with ozone monitoring programs, without any increase in its base budget. During that same time MLO staff was reduced from ten to eight due to the same budget shortfalls. In FY 1998 the South Pole Observatory, which conducts an ozonesonde program to monitor the Antarctic ozone hole, ran out of sondes at the peak of the 1998 Antarctic ozone hole season and had to borrow sondes from another institution to complete the year's measurements. Without these instruments it is impossible to monitor the status of the ozone hole and the progress that has been made in reversing its growth.



Total atmospheric chlorine from human fluorocarbon emissions peaked in 1994 and in response to the Montreal Protocol, has since declined.



The blue trend line shows the loss of 5% of the ozone across the heartland of America since 1979 (Fresno, CA; Boulder, CO; Nashville, TN; and Wallops Island, VA). Although the *rate* of ozone loss has decreased in recent years, it will require many years before the ozone layer recovers.

The Atmospheric Research Observatory which houses NOAA's Clean Air Facility at the South Pole where continuous measurements have been conducted since 1957.

Proposed Actions

These funds will maintain and expand operations at NOAA's remote manned baseline observatories, repair the stations' buildings, and allow for enhanced monitoring at other locations. Specifically, funds are needed to: (1) rehabilitate the aging Barrow, AK, Mauna Loa, HI, and Samoa observatories by upgrading the equipment and facilities; (2) rebuild the road leading to the Mauna Loa Observatory; (2) upgrade the Dobson ozone spectrometer equipment located at 11 sites in the U.S.; (3) support ozonesonde stations in Arcata, CA, and Huntsville, AL; and (4) upgrade eleven continuous surface radiation sites including the Alaskan UV network. Routine measurements of trace gases and aerosols will also be expanded to cover the continental U.S. and the Pacific basin. Lastly, funds are requested to expand baseline measurements of effluents flowing from the Asian mainland to Hawaii, Alaska and North America. As Asian economies continue to grow, their contributions to global climate forcing will increase and tracking these forcing agents should begin now.

Benefits

Benefits of this program have been tremendous to date. Carbon dioxide records from Mauna Loa and the South Pole have documented the rising carbon dioxide concentration of the global atmosphere. These data ushered in the whole science of climate change driven by trace gas increases and alerted mankind to the social, economic and political changes this may bring. The benefits of knowing that climate change is upon us and understanding what is driving it are of significant value to the scientific community and decision makers. Should the time come to monitor a global environmental response to emissions regulations, the NOAA global baseline observation network provides the only unbiased, uncontaminated record to track this response.

In a similar vein, the NOAA atmospheric chlorofluorocarbon time series shows an increasing trend in concentrations over time leading up to the appearance of the ozone hole. These NOAA data, the most comprehensive and continuous set available, are being used to monitor the ozone hole phenomenon. When the Montreal Protocol was implemented, the data set confirmed the leveling off, and now the decline in human released, ozone-destroying chlorine from chlorofluorocarbons. The economic costs of the transition to ozone-friendly substitutes is also measured in billions of dollars but is considered a boon to the U.S. economy as U.S. manufacturers lead the world in production and sales of the substitute compounds. To close the loop, NOAA baseline station surface and ozonesonde data are the prime global sets now used to document the recovery of the ozone layer, especially the ozone layer over the continental U.S.

Improved climate monitoring and predictions will enable resource managers in climate sensitive sectors such as agriculture, water management and energy supply to alter strategies and reduce economic vulnerability. In summary, this initiative provides the caliber of global data records needed to translate climate research gains into operational climate services whose potential benefits extend well into billions of dollars of economic value spread across all segments of society.

For more information, please contact Andrew Larkin in NOAA's Office of Legislative Affairs at 202-482-4630.